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The Influence of Modest Weight Gain on Taste and Smell Acuity in College Freshmen

P. Tomko
Bowling Green State University

J. Mansperger
Bowling Green State University

R. M. Tucker
Bowling Green State University

Mary-Jon Ludy
Bowling Green State University, mludy@bgsu.edu

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Authors: Tucker RM, Ludy MJ, Tomko PM, Mansperger J

Background: Reduced taste and smell acuities are common among those with high body mass index (BMI). Evidence of improved taste sensitivity after modest weight loss (~3-4 kg) exists in overweight individuals. Whether taste and smell decrements precede or result from weight gain is unknown. This study's purpose was to determine the effect of modest weight gain on taste and smell acuity.

Methods: College freshmen (n=60), a cohort at risk for modest weight gain, were assessed upon arrival to campus and 5 months later. Weight, BMI, and body fat percent (%BF) were measured. Intensity ratings for graded, suprathreshold concentrations of sweet (n=3) and salty (n=3) solutions, as well as a suprathreshold orange odor were assessed. Paired samples t-tests were used to indicate change from baseline to follow-up. Pearson correlation coefficients were used to identify associations between variables.

Results: Sixty participants (82% female, 92% white, 18.1±0.3 years) completed testing. BMI (22.9±3.8 to 23.6±4.1kg/m^2) and %BF (24.5±9.6 to 27.1±9.1%) increased at follow-up ($p<0.001$ for both). Weight gain (62.8±12.8 to 64.6±13.7kg, range -2.9 to +9.1kg) occurred in 79% of participants. No changes in taste intensity for low, medium, and high concentrations of sweet or salty solutions were observed. No change in smell intensity was observed over time, although smell intensity at follow-up was negatively associated with BMI ($r=-0.36$, $p=0.048$).

Conclusions: Modest weight gain in college freshmen did not influence taste acuity. Lack of change in intensity ratings may relate to use of suprathreshold concentrations rather than detection thresholds, or recruitment of a predominantly lean population.

Learning Outcome: Participants will be able to discuss the influence of weight change on taste and smell acuity.

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Patrick M. Tomko,[1] Josie A. Mansperger,[1] Robin M. Tucker[2], Mary-Jon Ludy[1]

[1]Department of Public and Allied Health, Bowling Green State University; [2]Department of Food Science and Human Nutrition, Michigan State University

Abstract

Background: Reduced taste and smell acuities are common among those with high BMI. Evidence of improved taste sensitivity after modest weight loss (~3-4 kg) exists in overweight individuals. Whether taste and smell decrements precede or result from weight gain is unknown. This study's purpose was to determine the effect of modest weight gain on taste and smell acuity.

Methods: College freshmen (n=60), a cohort at risk for modest weight gain, were assessed upon arrival to campus and 5 months later. Weight, BMI, and body fat percent (%BF) were measured. Intensity ratings for graded, suprathreshold concentrations of sweet (n=3) and salty (n=3) solutions, as well as a suprathreshold orange odor were assessed. Mann-Whitney-U tests were used to indicate change from baseline to follow-up. Spearman correlation coefficients were used to identify associations between variables.

Results: Sixty participants (82% female, 92% white, 18.1±0.3 years) completed testing. BMI (22.9±3.8 to 23.6±4.1kg/m^2) and %BF (24.5±9.6 to 27.1±9.1%) increased at follow-up ($p<0.001$ for both). Weight gain (62.8±12.8 to 64.6±13.7kg, range -2.9 to +9.1kg) occurred in 79% of participants. No changes in taste intensity for low, medium, and high concentrations of sweet or salty solutions were observed. No change in smell intensity was observed over time, although smell intensity at follow-up was negatively associated with BMI ($r=-0.36$, $p=0.048$).

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Introduction

- Taste and smell contribute to the hedonic value (or pleasantness) of food.
  - Hedonic value plays important role in food selection and intake (1).
- Individuals with high BMI typically experience impaired taste and smell sensitivity (2, 3).
  - This could cause them to eat more to achieve sufficient levels of reward (3).
- After weight loss, taste sensitivity improves (4, 5).
  - No studies have measured sensitivity changes as weight is gained.

Research Question

Does weight gain impair taste and/or smell acuity?

We hypothesized that first-year students who gained the most weight would experience decreases in taste and smell sensitivity.

Methods

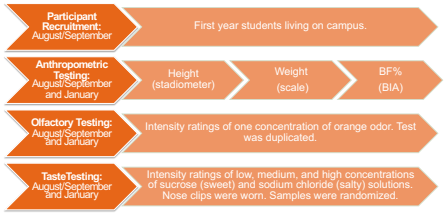


Figure 1. Study protocol

- SPSS (v 24.0, IBM Corp.) was used for analysis.
- Data were not normally distributed, so non-parametric tests were used.
- Due to the large degree of variation in weight change, participants were split into quartiles.
  - Comparisons were made between the lowest (≤ 25th percentile) and highest (≥ 75th percentile) gainers.

Results

- Among all participants (n=60)
  - Weight increased 1.9±2.3 kg from August/September to January ($p<0.001$, range -2.9 to +9.1kg).
  - %BF increased 1.9±3.4% from August/September to January ($p<0.001$, range -5.0 to +9.2%).
  - No differences in weight or %BF change were observed between males and females.
  - **No consistent correlations were seen with weight gain and taste or smell intensity ratings.**

Age	18.1±0.3 years
Sex	82% female (n=49)
Race	92% white (n=55)
BMI	22.9±3.8 → 23.6±4.1kg/m^2
%BF	24.5±9.6 → 27.1±9.1%
Weight	62.8±12.8 → 64.6±13.7kg

Table 1. Participant Characteristics

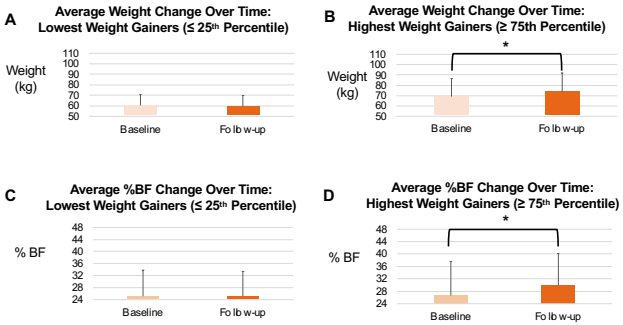


Figure 1. For the highest weight gainers (≥ 75th percentile) there were significant increases in both weight (B) and %BF (D) from baseline to follow-up ($p<0.05$). No significant differences were noted for the lowest weight gainers (A, C). N=15 per group and ⋆ denotes a significant difference.

Results (continued)

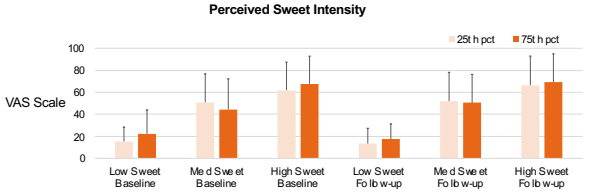


Figure 2. No differences in sweet intensity (ratings based on 100 mm) between individuals in the 25th percentile of weight gain compared to the 75th percentile (mean ± SD, n=15 per group). No differences were observed between baseline and follow-up for either group – indicating stability over time.

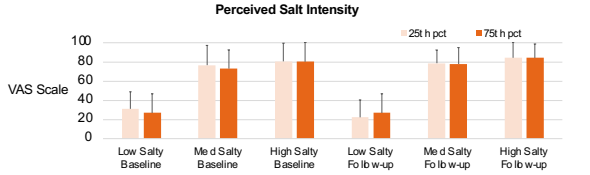
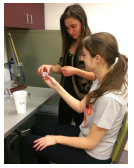


Figure 3. No differences in salt intensity (ratings based on 100 mm) between individuals in the 25th percentile of weight gain compared to the 75th percentile (mean ± SD, n=15 per group). No differences were observed between baseline and follow-up for either group – indicating stability over time.

Conclusions

- Modest weight, BMI, and %BF change did not influence perceived intensity of sweet and salty tastes or olfactory sensitivity in college freshmen.
  - This could be due to:
    - Suprathreshold concentrations rather than detection thresholds,
    - Predominantly lean rather than overweight/obese population,
    - Or the small sample size.



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